PATENT SPECIFICATION (11) 1 383 536

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(21) Application No. 13442/72 (22) Filed 22 March 1972 (19)

(44) Complete Specification published 12 Feb. 1975

(51) INT. CL.[2] A61F 7/00 F24J 1/00

(52) Index at acceptance
A5R 91
A5X 13
F4X 2

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(54) HOT OR COLD PACK

(71) We, KAY LABORATORIES, INC., a corporation organized and existing under the laws of the State of California, United States of America, of 3443 Camino del Rio South, San Diego, California, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the methd by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a hot or cold pack for adding heat to or absorbing heat from an animate or inanimate object. Packs of this type may be used for medical purposes, for handwarming, etc.

Hot and cold packs use first and second chemicals which are reactive upon mixing to give off or absorb heat. The chemicals are separated from each other by rupturable means and upon rupture of the rupturable means, the chemicals mix and react. The reaction is suitably confined within a sealed container.

In a typical use of the pack, it is manually held against an area of the body to which it is desired to apply high or low temperature. The life of the pack, i.e., the time during which the pack remains at a temperature other than the object it contacts is limited. One problem is how to prolong the life of the pack without increasing the size and weight of the pack through the use of additional quantities of the chemicals.

Heretofore packs have included a container of plastics material. The plastics container has minimal insulating qualities and thus, its temperature is substantially at the temperature of the reacting chemicals which may be, for example, 180°—200° F. for a hot pack and about 19° or 20° F. for a cold pack. The preferred temperature ranges are typically 115° F. to 125° F. for a hot pack and about 33° F. to about 40° F. for a cold pack. Because the outer surface of the plastics container is at substantially the reaction temperature, the life of a pack utilising a plastics container of this type is short. In addition, the plastics container causes some discomfort especially when used for medical purposes in that the plastics container lacks desirable "feel" qualities. Another problem with cold packs using such an outer container is that moisture from the air condenses on the outer surface of the plastics container and this condensation causes discomfort to the user.

According to the present invention there is provided a pack for adding heat to or absorbing heat from an object comprising first and second chemicals within a container which are reactive upon mixing to give off or absorb heat, rupturable separating means separating the chemicals to prevent mixing thereof such that when the rupturable separating means is ruptured the chemicals can mix and react, the container including means for preventing leakage of said chemicals from the container, and at least a portion of the wall of the said container including a layer of solid poor heat-conducting material.

The present invention increases pack life and especially hot pack life by utilising a container having an insulating layer. In this manner the temperature of the outer surface of the pack can be controlled to a temperature within or closer to the desired range.

To provide a pleasant feel the container preferably includes an outer layer of relatively soft material. To eliminate the discomfort caused by moisture condensation on the outer surface of a cold pack, the outer layer may also be absorbent. This is desirable when the pack is to be used in contact with an area of the body which can be expected to give off moisture such as perspiration or the moisture frequently accompanying a wound.

The use of absorptive material creates a problem to the extent that it causes the absorbed moisture to contact the insulating

layer. If the insulating layer is wet, the thermal conductivity thereof increases with consequent loss of the insulating effect. Preferably, a layer of moisture impervious material is provided between the insulating layer and the outer layer to prevent any moisture absorbed by the outer layer from contacting the insulating layer and changing the thermal conductivity thereof.

Although the present invention is not limited to any particular arrangement of the chemicals within the container, in a preferred form of the invention the first chemical is provided in a rupturable container and the second chemical and the rupturable container are provided within an intermediate container. The intermediate container is then inserted within the container described hereinabove.

To facilitate assembly of the container, it preferably includes an inner layer of heat-sealable material. The heat-sealable material is preferably moisture impervious to thereby prevent leakage through the container and to prevent wetting of the insulating layer from within the container by the chemicals, one of which is usually a liquid. The moisture-impervious layer between the outer layer and the insulating layer also serves as a safety factor to assist in preventing leakage of the chemicals through the container. If the chemicals were to leak through the container, they could cause discomfort especially if the chemicals were permitted to contact the eyes or an open wound. Embodiments of the invention, will now be described, by way of example, with reference to the accompanying drawings, in which:—

Figure 1 is a perspective view of a pack constructed in accordance with the invention;

Figure 2 is a side elevational view of the pack;

Figure 3 is a typical fragmentary enlarged sectional view of the wall of the pack;

Figure 4 is a side elevational view partially in section of the pack;

Figure 5 is a typical fragmentary sectional view similar to Figure 3 showing a second form of wall construction for the outer container of the pack of Figures 1 and 2.

Referring to Figures 1 and 2 of the drawings, reference numeral 11 designates a pack constructed in accordance with the invention. The pack 11 generally includes an outer container 13 having a packet 15 (Figures 1 and 4) therein for confining a chemical reaction within the outer container.

The outer container 13 is a flexible, bag-like sealed container. The outer container 13 includes an upper wall portion or wall 17 and a lower wall or wall portion 19. The words "upper" and "lower" only have reference to the relative positions of the walls 17 and 19 as viewed in Figs. 1 and 2. It should be understood that the pack 11 can be utilized in any spatial orientation, and accordingly, the words "upper" and "lower" should not be considered as limiting but merely as descriptive of the relative positions of the walls 17 and 19 as illustrated in Figs. 1 and 2.

Although the outer container 13 could be constructed in many different ways, in the embodiment illustrated the walls 17 and 19 form the entire outer container. The walls 17 and 19 are substantially co-terminous and confronting marginal regions thereof are heat-sealed together to form generally parallel side seals 21 and generally parallel end seals 23.

Fig. 3 shows a preferred construction for the wall 19, it being understood that the wall 17 may be of identical construction if desired. The wall 19 in the embodiment illustrated is relatively flexible and of laminated construction. The thickness of the several layers illustrated in Fig. 3 are greatly enlarged for clarity.

The wall 19 includes an outer layer 31 having an outer surface 33 adapted to contact the surface of the object with which heat transfer is to occur. In order that the outer surface 33 should be comfortable to touch, i.e., have the desired tactile properties, be moisture-absorbing, and present a good appearance, the outer layer 31 can advantageously be constructed of one or more layers of tissue paper or similar soft, moisture-absorbent material.

The wall 19 includes an insulating layer 37 sandwiched between a moisture-impervious layer 39 and an inner layer 41. The insulating layer 37 is constructed of thermal insulating material having the desired coefficient of heat transfer. The insulating layer 37 is preferably substantially thicker than the other layers of the wall 19. Foamed plastics materials such as polyurethane foam possess suitable properties. Another advantage of the insulating layer is that it gives the container 13 a desirable soft, compressible characteristic.

All of the layers of the wall 19 shown in Fig. 3 are preferably coextensive. The moisture-impervious layer 39 performs the important function of preventing wetting of the thermal insulating layer 37 by liquid which might be absorbed by the outer layer 31. In addition, the moisture-impervious layer 39 serves to adhere the outer layer 31 to the insulating layer 37. The material of the moisture-impervious layer 39 should be suitable for bonding with the layers 31 and 37. In the embodiment illustrated, the layer 39 is a thin film of polyethylene which has been heated to bond the insulating layer 37 to the outer layer 31.

The inner layer 41 is provided to render

the wall 19 a heat-sealable. Accordingly, the inner layer 41 may be constructed of a heat-sealable plastics material such as polyethylene. The inner layers are heat-sealed together to form the seams 21 and 23. In addition, the inner layers are moisture-impervious thereby assuring that no leakage through the outer container 13 will occur.

The outer container 13 can be used with many different arrangements for producing endothermic or exothermic reactions and the packet 15 shown in Fig. 5 is merely illustrative. The packet 15 includes an intermediate container 43 and a rupturable container 45 within the intermediate container. For clarity the walls 17 and 19 are shown as single layers in Fig. 4, it being understood that Fig. 3 depicts the actual construction of the walls 17 and 19 in the illustrated embodiment.

The packet 15 also includes a flowable chemical 47 sealed within the rupturable container 45 and a second chemical 49 within the intermediate container 43 and outside of the rupturable container 45. The chemicals 47 and 49 are of the type which will react exothermically or endothermically. By way of example, if the pack 11 is to give off heat, the flowable chemical 47 may be water and the chemical 49 may be anhydrous calcium chloride ($CaCl_2$) in granular form. If an endothermic reaction is desired, the flowable chemical 47 may be water and the chemical 49 may be ammonium nitrate (NH_4NO_3) in pellet or granular form.

The rupturable container 45 must be tightly sealed to prevent inadvertent mixing of the chemicals 47 and 49 and must be rupturable in response to a predetermined activity on the part of the user such as striking of the pack 11. The rupturable container 45 may be constructed, for example, of one or more layers of flexible plastics sheet material and it may have a suitably preweakened region to facilitate rupture thereof in response to an impact blow. For example, the rupturable container 45 may be constructed of laminated sheet material having an inner layer of low density polyethylene and an outer layer of polyethylene terephthalate. Such a container may be preweakened as disclosed, for example, in our copending patent application No. 16247/72 (Serial No. 1,379,996).

The intermediate container 43 is also sealed and serves the purpose of confining the chemicals 47 and 49 during the time that they are reacting. The container 43 must not be reactive with the chemicals 47 and 49. In addition, the intermediate container 43 should be relatively flexible so that an impact blow struck against the outer container 13 can be readily transmitted to the rupturable container 45. By way of example, the intermediate container 43 may have an inner layer 51 of a polyethylene composition to allow the inner surfaces of the intermediate container to be heat-sealed to form a seam 53 which extends completely around the intermediate container. The intermediate container 43 may also include an outer layer 55 of suitable material such as polyethylene terephthalate to impart strength to the container.

In use of the pack 15, the user strikes the outer container 13 with an impact blow to thereby rupture the rupturable container 45. This permits the flowable chemical 47 in the rupturable container to contact and mix with the chemical 49 to produce an exothermic or endothermic reaction. The pack 11 is then placed with the outer layer 31 of the wall in contact with the object with which heat transfer is to occur.

During use of the pack 11, the outer layer 31 provides the desired softness and comfort for the user while also being capable of absorbing some moisture. The insulating layer 37 maintains the temperature of the outer surface 33 preferably within the range of 115° to 125° F. for a hot pack and the layer 39 prevents moisture absorbed by the layer 31 from affecting the thermal conductivity of the insulating layer 37. Should the intermediate container 43 leak or inadvertently rupture, the layers 41 and 39 cooperate to prevent leakage through the container 13 to thereby protect the user against injury from the chemicals 47 and 49.

The wall construction shown in Fig. 3 is particularly adapted to use with a hot pack; however, its use is not necessarily so limited. Fig. 5 shows an alternative form of wall 19*a* for the outer container 13. The wall construction shown in Fig. 5 is particularly adapted for use with a cold pack and the construction shown in Fig. 5 may be used for either one of the walls of the container 13.

The wall 19*a* is of laminated construction and includes an outer layer 31*a* and an inner layer 41*a*. The outer layer 31*a* has an outer surface 33*a* which is adapted to be placed in contact with an animate or inanimate object. The outer layer 31*a* may be identical to the outer layer 31 (Fig. 3).

The inner layer 41*a* should render the wall 19*a* capable of being heat sealed and accordingly the inner layer may be of a heat-scalable plastics material such as polyethylene. The polyethylene also adds strength to the wall 19*a*. The layer 41*a* may be identical to the layer 41 (Fig. 3).

By comparing Figs. 3 and 5, it can be seen that the wall 19*a* is identical to the wall 19 except that the former has no insulating layer or layer corresponding to the layer 39. The wall 19*a* has the desirable tactile properties and is moisture absorbent. The moisture-absorbing quality is particularly desirable in

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a cold pack where condensation tends to form on the surface 33*a*. The wall 19*a* is made moisture-impervious by the presence of the inner layer 41*a*.

WHAT WE CLAIM IS:—

1. A pack for adding heat to or absorbing heat from an object comprising first and second chemicals within a container which are reactive upon mixing to give off or absorb heat, rupturable separating means separating the chemicals to prevent mixing thereof such that when the rupturable separating means is ruptured the chemicals can mix and react, the container including means for preventing leakage of said chemicals from the container, and at least a portion of the wall of the said container including a layer of solid poor heat-conducting material.

2. A pack according to claim 1 in which the leakage-preventing means comprises a moisture-impervious layer.

3. A pack according to claim 2 in which the moisture impervious layer is of heat-sealable material, said moisture impervious layer being heat-sealed to close said container.

4. A pack according to claim 2 in which at least one of the chemicals is a liquid the layer of moisture-impervious material being disposed between the insulating layer and the chemicals to prevent the said one chemical from wetting the insulating layer.

5. A pack according to claim 4 in which the layer of moisture-impervious material is of a heat sealable material and lines the interior of the container, the material being heat sealed to seal the container.

6. A pack according to any of the previous claims in which the container is of flexible material.

7. A pack according to any of claims 1 to 6 in which the rupturable separating means comprises a rupturable container located inside the container, said rupturable container having the first chemical therein.

8. A pack according to claim 7 in which the rupturable container is of flexible material.

9. A pack according to any of claims 1 to 7 in which the container has an outer layer of a soft moisture-absorbent material outside the leakage-preventing means such that the said outer layer can be placed against an object to which heat is to be added or from which heat is to be absorbed.

10. A pack according to claim 9 including a moisture-impervious layer intermediate the outer layer and the insulating layer for preventing contact between the insulating layer and any liquid absorbed by said outer layer.

11. A pack according to claim 9 or 10 in which the layer of moisture impervious material bonds the outer layer to the insulating layer.

12. A pack according to any of claims 1 to 11 in which the leakage-preventing means includes a further container within the first-mentioned container.

13. A pack according to claim 9 in which the said further container is of flexible material.

14. A pack for adding heat to or absorbing heat from an object, substantially as described hereinbefore with reference to the accompanying drawings.

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Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1975.
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY
from which copies may be obtained.

BNSDOCID: <GB 1383536A I >

1383536 COMPLETE SPECIFICATION
1 SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig.1

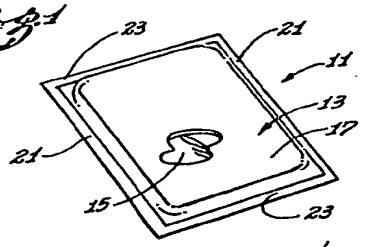


Fig.2

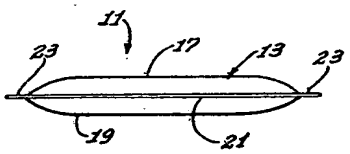


Fig.5

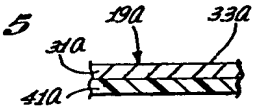


Fig.3

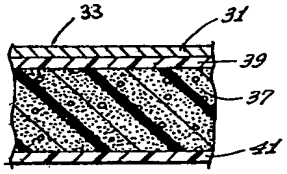
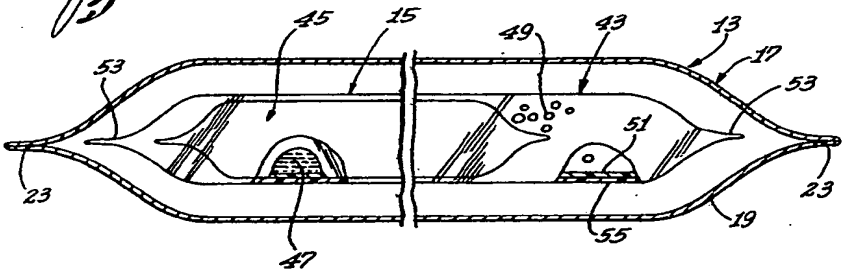


Fig.4



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